

The Story behind desert locust outbreak in India

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Locusts are the swarming phase of short horned grasshopper (Acrididae: Orthoptera). They can breed rapidly in an exponential manner under suitable conditions and subsequently become gregarious and migratory. They can travel a great distance and damage the crop extensively on their way. The major locust species all around the world are Desert locust (*Schistocerca gregaria*), Migratory locust (*Locusta migratoria*), Bombay locust (*Nomadacris succincta*), Tree locust (*Anacridium rubripinum*), Italian locust (*Calliptamus italicus*), Red locust (*Nomadacris septem-faciata*), Moroccan locust (*Dociostaurus moroccanus*), Brown locust (*Locustana pardalina*), American locust (*Schistocerca paranensis*) and Australian locust (*Chortoceter terminifera*). Desert, Migratory, Bombay and Tree locusts are reported from India. Of these desert locust is most notorious one. A swarm of desert locust can be 1200 sq kilometer in size. Each locust can eat its weight in plants each day. So a swarm of such size would eat 192 million kilograms of plants every day. In 2019-20 there was an outbreak of desert locust in western and North-West Africa which further expanded to South-west Asia amid congenial environment. In India although there was no impact on rabi (winter) crops like wheat, pulses and oilseeds, but most of the late sown pulses and orange orchards were attacked severely by them. Due to

changing weather conditions their outbreak increased and causing losses it can be visualized as a clear depiction of climate change.

Active breeding areas of desert locusts

The population outbreak of desert locust can be well understood after knowing its usual habitats. During recession period desert locusts inhabit and infest a broad belt of arid and semi-arid regions (between West Africa and North-west India) covering deserts of 25 countries. When favorable conditions boost the population they invade nearly 60 countries over 30 million sq km (WMO and FAO, 2016).

Within the recession area the movement of locusts is influenced by winds. The wind flows bring them into particular zones during the summer (Sahel and Indo-Pakistan desert) and during the winter/spring (North-West Africa, along the Red Sea, in Baluchistan (Pakistan) and the Islamic Republic of Iran) (Figure 1).

The locust affected countries grouped into three regions.

- a. Western region: Western and North-West Africa (Algeria, Chad, Libya, Mali, Mauritania, Morocco, Niger, Senegal and Tunisia).
- b. Central region: Along the Red sea, Djibouti, Egypt, Eritrea, Ethiopia,

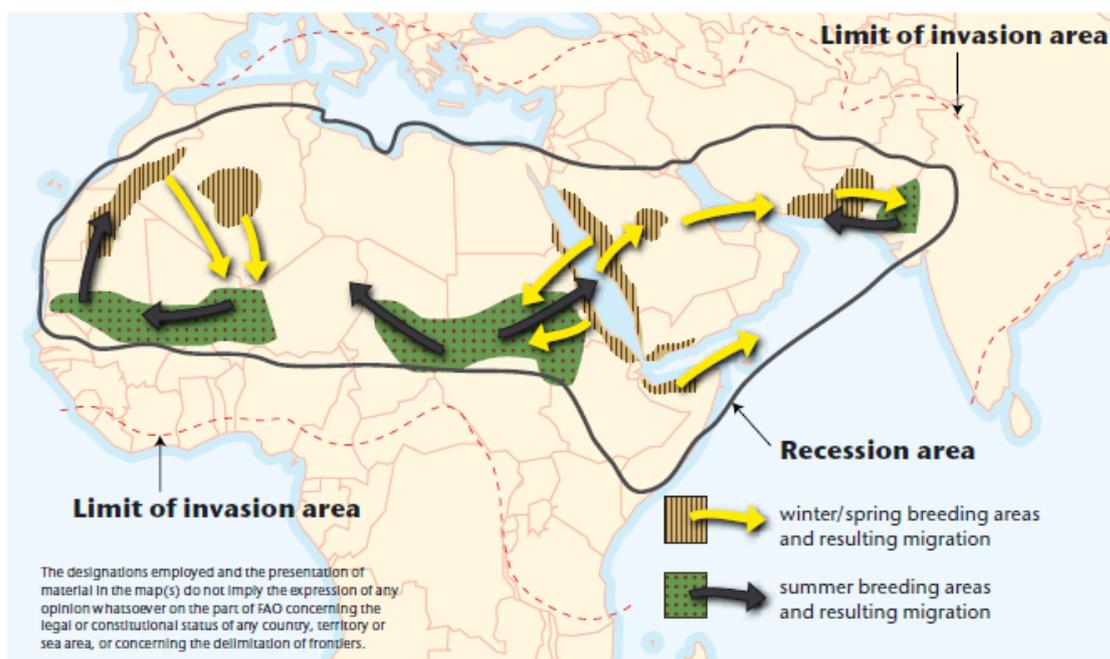


Fig. 1. Desert locust recession areas (Source: WMO and FAO, 2016; WMO-No. 1175)

Oman, Saudi Arabia, Somalia, Sudan, Yemen. During Plagues only Bahrain, Iraq, Israel, Jordan, Kenya, Kuwait, Qatar, Syria, Tanzania, Turkey, UAE and Uganda

- a. Eastern region: South-west Asia-Afghanistan, India, Iran and Pakistan

Reasons for outbreak in 2019-20

As per the available literature, locust plagues were observed during the early 19th century to first half of 20th century. From 1973 to 1989 very few numbers of locust upsurges were observed (2 to 26). In 1993, 172 locust upsurge were observed (estimated loss was Rs. 7.18 lakh). In December 2019, the locusts destroyed over 25,000 hectares of crops in Gujarat. In 1998, 2002, 2005, 2007, 2010 very few swarming with small scale breeding was observed. But in 2019 the breeding sites were drastically increased to 1500) And in 2020, the locusts have already been reported to have destroyed crops in 18 districts of Rajasthan and 12 districts of Madhya Pradesh while crops in Uttar Pradesh, Punjab, Haryana,

and Maharashtra were under threat of nearly 40 million locusts per square km.

During 2020-21, the locust incursions were reported in 10 States of Rajasthan, Madhya Pradesh, Punjab, Gujarat, Uttar Pradesh, Maharashtra, Chhattisgarh, Bihar, Haryana and Uttarakhand, where operations were undertaken in coordination with State Governments for locust control. State Governments of Gujarat, Chhattisgarh, Punjab and Bihar have reported no crop losses in their States. Initially during May-June 2020, Government of Rajasthan reported crop damage of 33% and more due to locust attack in 2235-hectare area in Bikaner, 140 hectare in Hanumangarh and 1027 hectare area in Sri Ganganagar; but now, as per revised report, it has been stated that earlier submitted data was related to initial stage of crop sown in Kharif season and this area of crop loss has been re-sown by farmers. State Governments of Haryana, Madhya Pradesh, Maharashtra, Uttar Pradesh and Uttarakhand have reported crop damage of less than 33% in 6520 ha, 4400

ha, 806 ha, 488 ha and 267 ha respectively due to locust attack this year (Ministry of Agriculture and farmers welfare, 2020).

a. Heavy rainfall over eastern Africa and the Arabian Peninsula: The Indian Ocean Dipole phenomenon

The outbreak of desert locust crisis can be traced back to May 2018. During this period cyclone *Mekunu* passed over an unpopulated desert on the southern Arabian Peninsula known as the Rub' al Khali. As a result, the sandy areas were filled with ephemeral lakes. This favoured the breeding of desert locust. This favoured the breeding of desert locust. The population growth of locusts was further amplified in October 2018 by Cyclone *Luban*. This was spawned in the central Arabian Sea, marched westward, and rained out over the same region near the border of Yemen and Oman. Usually, these areas get very rare cyclones. These unusual heavy rains were tied to fluctuations in the Indian Ocean Dipole. The main locust breeding areas in the Horn of Africa, Yemen, Oman, Southern Iran and Pakistan's Baluchistan and Khyber Pakhtunkhwa provinces recorded widespread rains in March-April. Experts says a prolonged bout of exceptionally wet weather, including several rare cyclones that struck eastern Africa and the Arabian Peninsula over the last 18 months, is the primary culprit.

East Africa experienced unusually widespread and intense autumn rains, which were capped in December by a rare late season cyclonic storm 'Pawan' that made landfall in Somalia. These events triggered yet another reproductive spasm. Quasi uniform trade winds, seasonal displacement of ITCZ (Inter Tropical Convergence Zone) and extra tropical depressions also contributed in aggravating the locust plague.

In late 2019 (Oct-Nov), unusual warm waters in the western Indian Ocean lead to heavy rainfall in Eastern Africa and The Arabic Peninsula. These warm waters were caused by the amplified Indian Ocean Dipole (IOD). Because of this dipole the western Indian Ocean remained warm as compared to the eastern part. The intensity of IOD is positively correlated with the rainfall in the East African region between October and December (Hirons and Turner, 2018). The Eastern Africa received its wettest rainfall season in over four decades during October to November, 2019. Heavy rainfall triggered the growth of vegetation in arid areas which ultimately favoured the desert locust population outbreak. In the beginning of 2020, main locust breeding areas of Horn of Africa, Yemen, Oman, Southern Iran and Pakistan's Baluchistan and Khyber Pakhtunkhwa provinces received heavy rains and that further triggered the population build up

b. Western disturbances and irregular heavy rains

The increased pre-monsoon rains have in turn been caused by the increased frequency of western disturbances (WD which are low pressure systems that originate in the Mediterranean Sea or mid-west Atlantic Ocean, move eastwards and are the cause of most of North western India's pre monsoon rain. Scientists have also said that the increased WD activity could have a polar connection and be linked to the polar vortex – a low pressure system of extremely cold swirling air in the north and south poles. Every year during December to March, an average of 4–6 western disturbances (WD) per month reaches to India. This year there was larger than usual number of WDs active over India. So, this might have partially

contributed to the excess pre-monsoon rains and rapid triggering of the locust outbreak in India.

c. Unusual rainfall over Rajasthan and other Indian regions

During March 2020, India received rainfall a total surplus of 47 %. Central India received excess rainfall (surplus rain of 219 %,) followed by Northwest India which has received 75% excess rain. The excess rainfall over North West and Central India can be attributed to a large number of Western disturbances. All-together 7 western disturbances have approached Western Himalayas during March. The month of March recorded widespread rains over Punjab, Haryana, Rajasthan, Uttar Pradesh, Bihar, Madhya Pradesh, and Maharashtra. Gujarat also experienced unseasonal rains on a few occasions. Also, South-east Iran and south-west Pakistan (Iran-Pakistan region) received too much rain in January 2020 which attracted the swarming. The desert locust swarms started arriving in Rajasthan during the first fortnight of April. Locust Warning Organisation observed “low-density I and II instar gregarious/transient hoppers” at Jaisalmer and Suratgarh in Rajasthan and Fazilka in Punjab adjoining the Indo-Pakistan border. Subsequently, there has been the arrival of swarms from the main spring-breeding areas. The unprecedented rainfall lead to lush vegetation and favoured locust population build up.

d. Possible impact of Cyclone Amphan

Having arrived in India through Iran and Pakistan, the locusts have not just registered their presence in the border states of Rajasthan and Gujarat, but in the interiors of Maharashtra, Uttar Pradesh and Madhya Pradesh as well. The FAO mentioned, much

of these movements were associated with strong westerly winds from Cyclone Amphan in the Bay of Bengal. While the rabi crops, recently harvested, survived the onslaught, the locusts can take a heavy toll on India’s kharif produce if not controlled by the time the harvest season arrives. Due to the heavy pre-monsoon showers(March-May) owing to the extremely positive IOD, the swarms were attracted to the North and Central India due to the availability of green pastures as well as barren lands to lay eggs in the arid and semi-arid regions.

e. Lack of proper control measures to stop the plague by Iran and Yemen

Experts believed that the current locust invasion was part of the residue population that survived after February 17, 2020 in the deserts of Pakistan and Iran. After 1993, for the first time in May 22, 2019, large swarms of locusts invaded bordering areas of Pakistan.

Control operations were less successful in Iran and Yemen. On February 17, 2020 the Iran and Yemen plant protectionists could either have controlled all the locusts or forced them to go across the border in Pakistan and Iran. They stopped the locust control measures and expected that Pakistan would take similar measures to eliminate them, but, the residue population continued breeding (FAO, 2019).

Conclusion

Being a highly polyphagous pest, desert locust feed any greenery on their way. Last one and half a year the unusual rain and wind patterns through various cyclones favoured the locust population *via* greening many deserted areas. These weather factors are the direct impact of global swarming. Secondly, cyclones altered wind pattern temporarily. The swarms of locusts, unable

to stay in the deserts moved southward to Yemen and entered Africa creating a famine-like situation. They have impacted almost the entire eastern Africa and parts of North Africa. Intensive research regarding their bionomics, host ecological interrelationship and forewarning system can mitigate possible losses by them. Experts says since from the past 20 years less attention has been paid towards locust research in India. In this regard there is an urgent need to conduct basic and applied research on host-ecological interrelationship and development of forewarning system to mitigate locust menace timely in near future

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